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PHYSICAL SCIENCES

LASER DELEGATION'S IMPRESSIONS DURING U.S. VISIT RECOUNTED

Shanghai JIGUANG in Chinese Vol 6, No 11, Nov 79 signed to press 25 Aug 79 pp 51-55

[Article by Wang Zhijiang [3769 0037 3068], Shanghai Institute of Optics and Precision Instruments, Chinese Academy of Sciences, and Zhang Zhiming [4545 1807 7686], Department of Physics, Fudan University: "Impressions on Lasers in Visit to the United States"]

[Text] In early summer of 1979, the Instrument Society of China, on the invitation of the U.S. Institute of Electrical and Electronics Engineers (IEEE) and the Optical Society of America (OSA), formed a laser delegation to attend the 7th Conference on Laser Engineering and Applications (CLEA), held in Washington, capital of the United States. The delegation consisted of several comrades concerned with laser research, education, production, and administration, and affiliated with the Academy of Sciences, Ministry of Education, First Ministry of Machine Building, and Fifth Ministry of Machine Building. CLEA was held for 3 days, from 30 May through 1 June 1979. While the conference was in session they also held a laser exhibition. After the conference, from 2 through 17 June, the delegation visited seven universities (Massachusetts Institute of Technology, University of Rochester, Stanford University, University of California at Berkeley, University of Southern California, University of Arizona, and University of California at San Diego), four laser institutes or research laboratories (Bell Laboratories, KMS Fusion Incorporated, Ford Motor Company Research Laboratory, and University of California Lawrence Livermore Laboratory), four plants specializing in laser devices (Avco Corporation, Spectra-Physics Inc., Coherent Inc., and Hughes Aircraft Co.), and four units developing laser applications (General Motors, Saint Nadick Audio Visual Service, Polaroid Corporation, and Sinai Hospital). Although these are just a small sample of the units, they reflect the general situation of the United States in laser research, production, and applications. Furthermore, since attending CLEA, we have come to understand some current trends and achievements in laser engineering and applications. Due to limitations of time and depth, our impressions are bound to have one-sided and even erroneous points.

The Conference on Laser Engineering and Applications is held once every 2 years (alternating with the International Conference on Quantum Electronics). The participants are mainly American scientists but Western European, Japanese, Soviet, and Eastern European scientists also usually attend, so it is indeed international. This was the first time attended the conference. The conference was divided into group sessions for papers and reports under 16 topics, and 201 papers were read. The conference was held in three conference halls simultaneously and it lasted

for 3 whole days and an evening. The topics of the sessions were: (1) Materials Processing, Biomedical and Other Novel Applications; (2) Tunable Filters, Modulators and Detectors; (3) Remote Sensing; (4) Laser Isotope Separation and Photochemistry; (5) Spectroscopy and Nonlinear Optics; (6) Adaptive Optics, Actuating Sensors and Radar; (7) Laser Annealing and Materials Processing; (8) Optical Communications (two sessions); (9) Excimer Lasers; (10) Laser Fusion (two sessions); (11) Optical Phase Conjugation Technology; (12) Infrared Lasers; (13) Tunable Lasers; (14) Optically Pumped and Short Pulse Lasers; (15) Optical Recording and Signal Processing; and (16) Bistable Devices and Other Applications. From the subject matter above, it can be seen that the scope covered by the papers was extremely broad. However, looking at it overall, it dealt with basic research on laser engineering and applications including research on laser devices, without being a rehash of already familiar laser applications.

There were 63 companies participating at an exhibition held concurrently with the conference. The products exhibited were mainly laser devices and components, laser measuring and testing instruments, optical components, and optoelectronic detectors.

Two award reports were presented during the conference. One was the 1979 Charnod Award to G. Fox and Dr Li Tingyi [0632 7844 3015] (Tingye Li) for the "discovery of the open-structured mode and its application in laser resonators." The other was the 1979 M. Liebermann Award to Dr Tian Binggeng [3944 3521 5087] (P.K. Tien) for "contributions to integrated optics technology." The three award winners were all researchers at Bell Laboratories and of those, two were scholars of Chinese descent.

Comrade Wang Zhijiang [3769 0037 3068] of the Chinese delegation also presented a paper at the conference, "China's Laser Science and Technology." Though the paper had arrived past the due date, it was assigned major importance, stood as a special invited paper, and was announced many times in advance. During the report many foreign scholars and nearly all the scholars of Chinese descent were present. Everybody expressed surprise and admiration at the many types of lasers already developed, the applied research, and the development of laser fusion in China presented in the report. After the report was finished, many scholars and conference attendees came up to offer congratulations.

During the entire course of our visit we were greeted with full warmth and friendship by the American scientists and we were deeply impressed by the depth and breadth of America's laser science and technology. We will now take up the items separately.

Sessions on laser devices included excimer, infrared, tunable, optically-pumped, and short-pulse lasers. Avco Corporation reported obtaining a 1-microsecond pulse, 10 percent efficiency, and an output of 12 joules/liter in a KrF* and XeF* laser. The Max Planck Laser Institute of West Germany obtained a laser output of 285 nanometers in the ultraviolet with the new CIF* in a halogen-family gas mixture of Cl₂ and F₂. During our visit we saw that many universities and research organizations were expanding their research in the excimer laser such as studying the process and mechanism of excitation reactions, and raising the output efficiency of the laser. This is because it has practical value in many areas.

In infrared lasers, some people reported research results for a TEA CO₂ minilaser. Japan reported on the operating conditions of a 1.5-kilowatt high-pressure continuous-wave CO₂ laser. The various universities we visited had many units devoted to submillimeter lasers and tunable lasers in the infrared waveband. Considerable attention was also directed to research on detectors in this waveband. There was also much interest in the miniaturization of various types of CO₂ lasers.

The emphasis in tunable dye lasers was in research on how to obtain a frequency-stabilized laser output. Coherent Inc. reported on a ring dye laser that could obtain a 3-watt single-frequency output with a frequency at 0.2 megahertz and a tunable range of 300 gigahertz. Spectra-Physics Inc. reported on a relationship between frequency stability, length stability, and intracavity power by synchronous pumping. In the laser laboratories we saw, dye lasers were perhaps the most common tool, generally attaining monochromaticity at the megahertz level. In a report presented by the U.S. Bureau of Standards, a linewidth of less than 2 kilohertz was attained.

Other tunable color center lasers also attracted notice such as KF and F₂⁺ color center lasers with a continuous output which could attain 2 watts and a tunable range of 0.8 - 1.5 microns. A method has now been devised with a high-quality convenient low-temperature container to preserve the crystal and efficient conversion of the F₂ color center to an F₂⁺ color center by photoionization. Therefore, color center lasers have become popular and commercially available. There are also tunable infrared lasers similar to these using transition element (such as Ni, Cr, Co, V) activated crystals.

Optically pumped lasers included an Se laser with an output of 4 joules/liter at 4890 angstroms, formed by the photodissociation of OSe gas. An alkali metal laser was formed by the photodissociation of alkali-halide vapor. It was a minilaser with a peak power of 100 kilowatts that could obtain a high repetition rate in the 3800 - 9000 angstrom band. For miniaturized optically pumped crystals, besides neodymium pentaphosphate, neodymium-lanthanum pentaphosphate was also developed that could be used in minilasers with total dimensions of 6" x 3" x 3" including the flashlamp and energy source. Regarding short pulse technology, one could take note of using stimulated Raman back-scattering for pulse-compression technology. Livermore Laboratory thought that Raman compression by a KrF laser would be the optimal candidate for laser fusion.

Fiberoptic communications has entered the stage of engineering applications. Its potential possibilities for future development arouse even greater interest. A conference on this subject held by the Optical Society of America in early May 1979, drew almost 900 attendees which exceeded expectations. They discussed various problems from basic research to engineering applications. The two sessions at CLEA were of a trailblazing nature. The first session concentrated on semiconductor laser light-sources operating with a single-mode output at room temperature. Most of these light sources were multielement heterojunction structures on a binary base such as In_{1-x}Ga_xAs_yP_{1-y}/InP or Al_xGa_{1-x}As_ySb_{1-y}/GaSb with output wavelengths at 1.2 to 1.5 microns, threshold currents of 3.5 - 5 milliamperes/cm², and lifetimes of over 10,000 hours. MIT's Lincoln Laboratory reported on obtaining a continuous single-mode output in an external resonator, with a frequency drift of less than 5 megahertz/minute. It was expected that after mode-locking of an F-P etalon,

it could be less than 1 megahertz. The Nippon Telegraph and Telephone Corporation described the current status of optical communications in the 1 micron region. It was thought that present fiber attenuation had amounted to 0.5 decibels per kilometer at 1.2 microns, 0.5 decibels per kilometer in single mode and 0.34 decibels per kilometer in multimode at 1.3 microns, and 0.2 decibels per kilometer in single mode at 1.5 microns. In addition, at 1.3 microns it was nearly equal to the null chromatic dispersion of quartz material, and therefore the broadening caused by pulse transmission in single-mode fiber was very slight. Next was a four-element semiconductor laser with a high modulating capability, a wavelength that could cover 1.0 - 1.4 microns and a germanium avalanche diode with a fast response and a wavelength sensitivity up to 1.6 microns. Therefore it was thought that performance studies of communications systems could be conducted at longer wavelengths in the future. The other session concentrated on integrated optics and studies of individual components such as the mechanism of loss in lithium niobate waveguides, transmissivity measurements of optical fiber, and loss-free measurements of the refractive index profile.

It can be seen that the train of thought of the research was wide open and was not limited by progress already made or reduced to narrow technological research but was work with far-reaching efforts. It was both in the forefront and in depth.

The two sessions on fusion included achievements and plans in laser fusion from Japan, West Germany, England, and the Lawrence Livermore Laboratory, Los Alamos Laboratory, and Laboratory for Laser Energetics of the University of Rochester in the United States. For example, the Institute of Laser Engineering of the University of Osaka presented their Gekko IV four-beam 4-terawatt glass laser, and West Germany the Asterix 1-terawatt iodine laser. After the conference we visited three laboratories involved and we were even more deeply impressed with the development of neodymium glass lasers and the progress made by the fusion laboratories. By using space filters as the relay system and by cleaning the primary oscillation amplifier section, the wavefront uniformity was raised further and the power load of the device was raised 50 percent. The automatic adjustment and alignment system for the optical pathlength and the stability of the supports were successful. This large-scale 20-arm experimental device has already become a normally functioning tool. The KMS device will use shaped pulses.

The target is an important part of fusion research. It is essential for thoroughly understanding the fusion processes in experiments and for comparing the experiment with the theory. Therefore several major laboratories have devoted great effort to the manufacture and testing of targets so they could produce such targets as multilayer or low-temperature of the required quality.

In 18 months of operation from late 1977 to March 1979, the Shiva attained compression to a liquid density of 100 times (30 grams/cm³).

The session on laser isotope separation which received considerable attention for its present applications, had 18 reports. The Lawrence Livermore Laboratory used a multiphoton absorption (MPA) method to separate deuterium. They used a CO₂ laser with a pulsewidth of 2 or 100 nanoseconds and an energy density of 10 - 20 joules/cm². The working system selected was Freon 123 (CF₃CDCl₂), trifluoromethane (CDF₃) and methyl acetylene (D -- C ≡ C -- CH₃). Its enrichment factor showed

consistently good results, and they analyzed the conditions in which laser isotope separation would have valuable commercial applications. The U.S. Naval Research Laboratory suggested using a continuous-wave CO₂ laser for a nonresonant pumping method in which methane (CH₄) and CH₃D were separated by the principle of selective energy transfer from some sensitized molecules to the isotopes.

Though laser hot-working was used early in industry, recently there has again been progress. One thing is the use of high-power lasers to apply anti-corrosive layers to metal surfaces. Another is laser annealing of semiconductor surface defects. The latter is especially well-considered due to its excellent effect on the quality of the semiconductor. Laser annealing was performed on defects caused by ion-implanted dopants in the surface of semiconductor silicon. The lasers used were a 1.06-micron continuous-wave YAG and a continuous-wave CO₂ laser with powers of 20 to 30 watts. A pulsed KrF laser was also used. Laser annealing of a 1000-angstrom-thick amorphous silicon film could be accomplished in several milliseconds. This was a solid-phase epitaxial renewal process and there was no damage at all to the silicon single-crystal material of the substrate. The dopant concentration could be $10^{12} - 10^{15} \text{ cm}^{-2}$. The electron microscope confirmed that an excellent single-crystal film had been formed. Another laser applied research was the use of laser photodissociation of organometallic compounds to separate out metal films. The film could presently be several microns thick with sheer sides. The system used was dimethyl cadmium [Cd(CH₃)₂], tetramethyl tin [Sn(CH₃)₄], and trifluoromethane monoiodide (CF₃I). The lasers used were excimer or argon-ion in the ultraviolet. They also used a CO₂ laser. Its mechanism was not photodissociative but thermodissociative. By focusing a CO₂ laser beam on a substrate in a tetracarbonyl nickel [Ni(CO)₄] atmosphere, they could separate out nickel films. Hopefully these studies on new processing methods may have applications in the processing of semiconductors and mini devices for integrated optics.

In addition it is worth mentioning two types of applications at the conference which have not been reported much. One was an optical gyroscope which uses differences in passive position-finding and large-area circuits formed by fiber optics. It is sure to see further progress. The other type of application was laser recording and display which serve as computer output equipment. They have become objects of competition for several companies. The home videodisk has already become commercial. It should become the largest market for lasers. A videodisk running for 30 to 60 minutes on one side sells for 6 to 16 U.S. dollars and serves as a low-cost means for high-density information storage. It seems to have a very promising future and its function is certainly not just to provide home entertainment.

Finally, we should say something about our impressions of basic research in the United States. In general it seems that the United States regards basic research as very important. Applied research is mostly conducted in factory laboratories but basic research is conducted in universities or laboratories of certain large enterprises. For example, the Ford Motor Company Research Laboratory has promoted research on the highly excited fine structure of the hydrogen atom spectrum. According to our understanding, in prominent research organizations such as the Ford Motor Company Research Laboratory and Bell Laboratories, the selection of research problems is determined completely by the research personnel themselves. The company just requires that a certain number of papers be published in the

journals every year. Actually however, since there is a place for guidance, the problems selected by these research groups generally revolve around specific goals. For example, the Ford Motor Company's laser efforts are all concerned with detecting combustion and air pollution, and the Bell Laboratories are devoted to research on more advanced optical communications including obtaining laser sources with new wavebands and the transmissivity of those bands. This illustrates that the leaders of scientific research can effectively regulate the relationship of the initiative of the scientific research personnel with the general goals. As for the universities, the selection of research problems is of course freer than in some research institutes and may involve broader areas but it is restricted by the research funds requested for research organizations by the U.S. National Science Foundation, Department of Energy, and the three military services. The high regard by these organizations for basic research has promoted the development of science and has promoted the emergence of creative work.

Some of the basic research described above already has a clear applications goal-orientation or can be assumed to have a long-range applications goal-orientation. Such work is easy to support but it is certainly not the most basic research. It is called pay-off development in the United States. Yet basic research is research with no immediately visible practical value. Laser research in U.S. university physics departments is mostly of this character. They consider lasers a tool to develop laser spectroscopy and nonlinear optics, to develop thoroughly the physical properties or physicochemical processes of matter, or to verify the validity of physical laws. Many spectroscopic methods to eliminate Doppler broadening, already developed in the past, have been widely used to study the fine structure of atomic spectra such as the spectrum of the hydrogen atom and the spectra of highly excited states. Since there is such a tool as the picosecond pulsed laser, it can be used to study fast processes. The advantage of coherent anti-Stokes Raman spectroscopy (CARS), especially the high sensitivity of polarized CARS is it can be used to study many physical processes such as relaxation processes and phonons in liquid crystals. How to use optical methods to verify the validity of the theory of relativity or to verify the parity of weak interactions has attracted the attention of physicists even more.

American laboratory equipment is well advanced in all aspects of testing and measuring instruments. All kinds of signal processing and analysis, and computer and microprocessor applications are also widespread. Some laboratories also make some lasers themselves but generally speaking, all of them purchase finished products. In present-day American laboratories, hydrogen-ion-pumped tunable dye lasers are very widespread because to conduct research on laser physics, it is an indispensable tool.

In our visit, we found that there is always good mutual understanding among foreign scientists, exchange of materials among them is also very frequent, scientific thought is lively, and the appearance of new ideas and new methods gets encouragement and respect. There is something here worth drawing a lesson from.

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TITLE: "Successful Immunisation of Infants With Maternal Measles Antibodies by Partially attenuated Measles Vaccine"

SOURCE: Beijing LIUXINGBINGXUE ZAZHI [CHINESE JOURNAL OF EPIDEMIOLOGY] in Chinese Vol 1 No 3, Aug 80 pp 131-135

ABSTRACT: At present, the targets of immunization with attenuated live measles vaccine are children of more than 8-month of age; therefore, there is no way to eliminate the existence of infants susceptible to measles, while the mortality rate of measles is high among infants less than one year of age. This paper reports an experimental program of hypodermic injection of 1,000-3,000TCID₅₀ in 4 infants with low level of maternal measles antibodies (1:1 - 1:2). Immunisation of these infants was successfully obtained. Whether the success is related to the hypodermic pathway, the low level of antibodies, or the large dosage of vaccine, or some other reasons remains a subject to be clarified in the future. These problems are extensively discussed in the paper.

AUTHOR: None

ORG: Xiacheng District Public Health and Epidemic Prevention Station, Hangzhou; Infectious Disease Research Office, Zhejiang University of Medicine

TITLE: "Studies on the Characteristics of Occurrence of Post Vaccinal Measles and the Immune Status After Mass Inoculation With Live Measles Vaccine"

SOURCE: Beijing LIUXINGBINGXUE ZAZHI [CHINESE JOURNAL OF EPIDEMIOLOGY] in Chinese Vol 1 No 3, Aug 80 pp 136-139

ABSTRACT: Ever since the mass inoculation of attenuated live measles vaccine, the regularity of periodical epidemic of measles has changed. The incidence and mortality rate have dropped in a large scale, and the age of measles incidence has become older. According to reports of various regions of late, there has been some increase of mild cases, however. For the purpose of understanding the prolonged immune effects of measles vaccine and the clinical characteristics of post-inoculation cases, measles epidemiological data before and after the mass inoculation in Xiacheng District are compared; samples are taken to determine the antibody level of students of middle and elementary schools; measles patients and those who have contact with them are examined to determine their serum antibodies. Results of these studies are reported.

AUTHOR: None

ORG: Linyi County Epidemic Prevention Station, Shandong Province

TITLE: "A Survey Report on the Abnormal Reactions of Neurological System After Inoculation With Rabies Vaccine"

SOURCE: Beijing LIUXINGBINGXUE ZAZHI [CHINESE JOURNAL OF EPIDEMIOLOGY] in Chinese Vol 1 No 3, Aug 80 pp 143-145

ABSTRACT: Since Jun 78, the authors have applied rabies vaccine to 1107 victims of bites of rabid dogs. Of the group, abnormal reactions of the neurological system occurred to nine and one of these died. The rate of occurrence of abnormal reactions amounted to 0.81 percent. Vaccines of 3 manufacturers of Changchun, Wuhan, and Lanzhou were used, and incidence of abnormal reactions to the vaccines was 0.89 (4/450), 0.79 (4/507), and 0.67 (1/150) respectively. The clinical manifestations, the laboratory data, and the treatment and recovery processes of the cases of abnormal reactions are reviewed. These reactions are generally believed to be a form of allergic response of the nervous system. Histories of 3 such cases are included to illustrate these reactions.

AUTHOR: None

ORG: Guizhou Provincial Public Health and Epidemic Prevention Station; Guiyang Municipal Public Health and Epidemic Prevention Stations; Zunyi District Public Health and Epidemic Prevention Station; Anshun District Public Health and Epidemic Prevention Station; Guiyang City Fangzhi District Public Health and Epidemic Prevention Station; Zunyi City Public Health and Epidemic Prevention Station; Anshun City Public Health and Epidemic Prevention Station

TITLE: "Characteristics of New A₁ Influenza Epidemic of 1977 in Guizhou Province"

SOURCE: Beijing LIUXINGBINGXUE ZAZHI [CHINESE JOURNAL OF EPIDEMIOLOGY] in Chinese Vol No 3, Aug 80 pp 146-148

ABSTRACT: In Sep-Oct 77, an intermediate degree epidemic of the new A₁ type influenza appeared all over Guizhou Province involving 75 counties and cities. There were 544.8 cases in every one hundred thousand persons. It is believed that the mutation of the influenza virus is related to the increased rate of incidence. The disease spread very fast, attacking mainly young persons under 20 years of age. The clinical symptoms were mild and there were very few fatalities. This strain of influenza virus was first discovered in the beginning of Sep and within 10 days many schools in the central areas of the province had to be closed due to the epidemic. In 2 months' time 75 of the 84 cities (counties) of the province were seized by the epidemic.

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WU Ciqian [0702 3417 3383]

ORG: LIN of the Department of Mathematics and Mechanics; WU of the Department of Computer Science

TITLE: "The Third Characteristic Problem for the Systems of Hyperbolic Equations"

SOURCE: Guangzhou ZHONGSHAN DAXUE XUEBAO [ACTA SCIENTIARUM NATURALIUM UNIVERSITATIS SUNYATSENI], Natural Sciences Edition in Chinese No 3, Aug 80 pp 1-14

TEXT OF ENGLISH ABSTRACT: What we call the third characteristic problem for the system of the hyperbolic equations

$$\left[\begin{pmatrix} 1 & 0 \\ 0 & 0 \end{pmatrix} \frac{\partial^2}{\partial x^2} + 2 \begin{pmatrix} b_1 & 1 \\ b_2 & b_1 \end{pmatrix} \frac{\partial^2}{\partial x \partial y} + \begin{pmatrix} 0 & 0 \\ 0 & 1 \end{pmatrix} \frac{\partial^2}{\partial y^2} \right] \begin{pmatrix} u \\ v \end{pmatrix} = 0 \quad (H_1)$$

$$b_1 = b_1^* - \frac{1}{2} \left(k + \frac{1}{k} \right) b_2 + \frac{1}{4} \neq 0, \quad b_1 \neq 0, \quad 0 < k < 1,$$

is to look for the unknown functions u, v , satisfying the characteristic conditions

$$u|_{l_i} = \varphi_i(x), \quad v|_{l'_j} = \phi_j(x), \quad l'_j \neq l_i, \quad i=1,2,3$$

or

$$u|_{l_i} = \varphi_i(x), \quad v|_{l'_j} = \phi_j(x), \quad l_i \neq l'_j, \quad i,j=1,2$$

[Continuation of ZHONGSHAN DAXUE XUEBAO No 3, Aug 80 pp 1-14]

where l_1, l_2 are four characteristic lines of (H_1) . The sufficient and necessary conditions for the uniqueness of the third characteristic problem, as we know, is still left open.

In this paper we completely solve the above-mentioned problem, and also find out all trivial solutions for (H_1) .

AUTHOR: HUANG Youqian [7806 0645 6197]

ORG: Department of Computer Science

TITLE: "Error Estimations for Smoothing Functions"

SOURCE: Guangzhou ZHONG SHAN DAXUE XUEBAO [ACTA SCIENTIARUM NATURALIUM UNIVERSITATIS SUNYATSENI], Natural Sciences Edition in Chinese No 3, Aug 80 pp 15-22

TEXT OF ENGLISH ABSTRACT: In this paper, error estimations on the derivatives of finite orders for continuous and discrete forms of smoothing functions are given.

AUTHOR: XIE Pingmin [6200 1627 3046]

ORG: Department of Mathematics and Mechanics

TITLE: "On Mean Square Convergence of a Stochastic Riemann Sum"

SOURCE: Guangzhou ZHONGSHAN DAXUE XUEBAO [ACTA SCIENTIARUM NATURALIUM UNIVERSITATIS SUNYATSENI], Natural Sciences Edition in Chinese No 3, Aug 80 pp 23-28

TEXT OF ENGLISH ABSTRACT: This paper discusses mean square convergence of a stochastic Riemann sum and its application in the stochastic integral.

AUTHOR: DAI Yonglong [2071 3057 7127]

ORG: Department of Mathematics and Mechanics

TITLE: "On Markov Chains with a Potential"

SOURCE: Guangzhou ZHONGSHAN DAXUE XUEBAO [ACTA SCIENTIARUM NATURALIUM UNIVERSITATIS SUNYATSENI], Natural Sciences Edition in Chinese No 3, Aug 80 pp 29-34

TEXT OF ENGLISH ABSTRACT: Let E be a finite or countable infinite set, and $A = (a_{ij}, i, j \in E)$ be a real value matrix which satisfies the following conditions:

1) If $i \neq j$ and $i, j \in E$, then $a_{ij} \geq 0$

2) $a_{ij} > 0 \Rightarrow a_{ji} > 0 \quad i, j \in E$

when $a_{ij} > 0$, we let

$$\varphi_{ij} = \log \frac{a_{ji}}{a_{ij}}$$

The real number sequence $(u_i, i \in E)$ is called the potential of A if it satisfies the following condition:

$$u_j - u_i = \varphi_{ij}.$$

In this paper we present two notes on the matrix with a potential, and then apply them to a Markov chain and Q -matrix, thus obtaining the general form of a Markov chain and Q -matrix with a potential.

AUTHOR: SHI Longpei [0670 7127 1014]
CHEN Qizhou [7115 0796 3166]

ORG: Both of the Department of Physics

TITLE: "The Nonlinear Effects of the Ising Model in a Transverse Field"

SOURCE: Guangzhou ZHONGSHAN DAXUE XUEBAO [ACTA SCIENTIARUM NATURALIUM UNIVERSITATIS SUNYATSENI], Natural Sciences Edition in Chinese No 3, Aug 80 pp 35-44

TEXT OF ENGLISH ABSTRACT: In this paper we apply the method of the $n+1$ time Green function in analyzing the linear and nonlinear effects of the longitudinal polarization process of the Ising model in a transverse field. The linear and nonlinear polarizabilities and detection, mixing frequency, multiplying frequency and effects were obtained. The relationships between these effects and the tunneling integration, interaction integration, frequency and temperature are explained.

AUTHOR: MO Dang [5459 7825]
CHEN Shuguang [7115 2885 0342]
XU Geng [1776 5087]

ORG: All of the Department of Physics

TITLE: "Dispersion and Ellipsometric Spectrum of Silicon"

SOURCE: Guangzhou ZHONGSHAN DAXUE XUEBAO [ACTA SCIENTIARUM NATURALIUM UNIVERSITATIS SUNYATSENI], Natural Sciences Edition in Chinese No 3, Aug 80 pp 45-48

TEXT OF ENGLISH ABSTRACT: In this paper the influence of silicon dispersion (the relation between the refractive index and the wavelength of light) on the ellipsometric spectrum has been investigated. By measuring the ellipsometric spectra of several samples, each of which is covered with an oxide film, the dispersion curve is determined. The result is compared with data obtained with other methods by Meyer, et al., and by Philipp, et al.

AUTHOR: YAO Jie [1202 2638]
CHEN Baoqiong [7115 1405 8825]

ORG: Both of the Department of Physics

TITLE: "The Properties of Si-SiO₂ System Formed by Spin-On Emulsion"

SOURCE: Guangzhou ZHONGSHAN DAXUE XUEBAO [ACTA SCIENTIARUM NATURALIUM UNIVERSITATIS SUNYATSENI], Natural Sciences Edition in Chinese No 3, Aug 80 pp 49-53

TEXT OF ENGLISH ABSTRACT: The relation between the thickness of the spin-on silica films and the spin-on speeds (3200-4800 rev/min) and the method of preventing craze was examined. It was found that the interface fixed positive charge densities (N_{if}) were variable for the different heat treatments and the N_{if} of spin-on Si-SiO₂ interface was smaller than the N_{if} of thermally oxidized silicon interface. Good results have been achieved when this technology was applied in the making of surface inversion structure violet sensitive Si photoelectric detectors.

AUTHOR: HUANG Yukun [7806 3768 1507]

ORG: Department of Geology

TITLE: "The Fundamental Characteristics of Crustal Movements Along the Northern Coasts of the South China Sea Since the Neogene"

SOURCE: Guangzhou ZHONGSHAN DAXUE XUEBAO [ACTA SCIENTIARUM NATURALIUM UNIVERSITATIS SUNYATSENI], Natural Sciences Edition in Chinese No 3, Aug 80 pp 54-63

TEXT OF ENGLISH ABSTRACT: This paper discusses some problems of recent crustal movements in this area with various data of the geological, geomorphological, seismic and geodetic fields, and draws conclusions as follows:

1. There are three groups of main faults in this area--NE, NW, EW. They are still active faults and intersect each other, forming a network fracture picture. Most of the strong earthquake epicenters and hot springs occurred along the intersection portion.
2. The broad area of peneplain occurred during the early Tertiary, but it was rejuvenated along the old fault zones in different directions in Neogene. The amplitude of the emergence and submergence was about 5 km. It is still recurrent along the old fault zones.
3. Recent volcanic activity in this area is concentrated in the northern Hainan Island and Leizhou peninsula. It is subdivided into 10 eruptive stages and 58 eruptive cycles.

AUTHOR: DENG Guogan [6772 0948 2413]
LIU Deping [0491 1795 1627]

ORG: Both of the Department of Geology

TITLE: "A Study on the Mineralization Period of Two Strata-Bound Ore Deposits in Guangdong"

SOURCE: Guangzhou ZHONGSHAN DAXUE XUEBAO [ACTA SCIENTIARUM NATURALIUM UNIVERSITATIS SUNYATSENI], Natural Sciences Edition in Chinese No 3, Aug 80 pp 64-68

TEXT OF ENGLISH ABSTRACT: The iron ore of Shilu (Hainan Island) and Jianshan (Pingyuan County) is a sedimentary deposit; they have two ferruginous positions--one is Middle Carboniferous and the other pay sediment is the deposit of early Permian.

The stratum--Shilu Group have seven strata; the first through sixth strata are deposits of Carboniferous and the seventh stratum was formed in the early Permian. The sixth and seventh strata are the ferruginous positions.

Other iron ore deposits in eastern Guangdong, their mineralization period mainly formed in the Middle Carboniferous, perhaps originated from the oceanic volcano.

AUTHOR: None

ORG: Solid State Research Group, High Polymer Chemistry Research Institute

TITLE: "An Investigation on the Structure and Properties of the Modified Polypropylene Materials. 1. The Structure and Properties of IPP/LDPE Blend Materials"

SOURCE: Guangzhou ZHONGSHAN DAXUE XUEBAO [ACTA SCIENTIARUM NATURALIUM UNIVERSITATIS SUNYATSENI], Natural Sciences Edition in Chinese No 3, Aug 80 pp 69-77

TEXT OF ENGLISH ABSTRACT: In this article the relationship of the mechanical and physical properties of IPP/LDPE blended systems with the submacro-structure of the material is discussed. It has been found that, as the composition of IPP/LDPE 70/30 changes into 40/60, the phase inversion occurs. The framework of polypropylene spherulites, as observed between crossed polaroids, first contacts each other and is embedded with LDPE, and finally changes into the fragments of polypropylene in polyethylene. In between, there are crystalline interlinks found among the crystalline fragments of polypropylene. The mechanical and physical properties of IPP/LDPE blended systems are dependent upon the phase state, especially the impact strength.

AUTHOR: CHEN Yongzhao [7115 3057 0340]
XIE Jingming [6200 6975 2494]
CHEN Pelling [7115 0160 3781]
TAN Guanhe [6223 6034 3109]

ORG: All of the Department of Chemistry

TITLE: "The Uses of Masking Agents in Chelometry. IX. The Complexometric Titration of Tin in Tin Concentrate with Lactic Acid as Masking Agent"

SOURCE: Guangzhou ZHONGSHAN DAXUE XUEBAO [ACTA SCIENTIARUM NATURALIUM UNIVERSITATIS SUNYATSENI], Natural Sciences Edition in Chinese No 3, Aug 80 pp 78-82

TEXT OF ENGLISH ABSTRACT: We have found that lactic acid is an effective masking agent for tin (IV), and in the presence of lead, zinc, copper, bismuth, cadmium, nickel, cobalt and antimony, lactic acid can completely displace the EDTA from the tin-EDTA complex. Therefore, we worked out a displacement method for the titration of tin in tin-base or lead-base alloys. In this paper we modified the above method and found that in the titration of 10 mg of tin, not more than 3 mg of iron and 0.3 mg of aluminum (equivalent to 15 percent of iron and 1.2 percent of aluminum in the tin concentrate) did not interfere. We successfully use this method to determine the tin in a tin concentrate (with 52.89 percent tin) and the result is comparable to the iodometric method.

AUTHOR: WANG Bosun [3769 0130 1327]

ORG: Department of Biology

TITLE: "Studies on the Spore Morphology of Schizaeaceae from China"

SOURCE: Guangzhou ZHONGSHAN DAXUE XUEBAO [ACTA SCIENTIARUM NATURALIUM UNIVERSITATIS SUNYATSENI], Natural Sciences Edition in Chinese No 3, Aug 80 pp 87-91

TEXT OF ENGLISH ABSTRACT: This paper deals with the spore morphology of Chinese Schizaea. So far, three species are recognized in China, i.e., Schizaea biroi Peichter, S. dichotoma (L.) Sm. and S. digitata (L.) Sw. Of them, S. dichotoma is a new record in China.

The spore morphology of Chinese Schizaea is a tetragonal tetrad with monolete; the equatorial view is nephroid, or bean-form, or semiorbicular; the polar view is broad-elliptic; NPC 113. However the proximal face view of Schizaea digitata is nauti-form under Scanning Electron Microscope.

The spore sexine patterns of Schizaea digitata are costate, while others are tuberculate. As the frond of Schizaea digitata is grass-form, it bears at the apex an apparently digitate group of fertile; while others are dichotomously branched, with fertile lobes pinnetely arranged at the end of the branch of the frond. Consequently, there is a certain correlation between the spore sexine patterns and the frond branching system of Chinese Schizaea.

[Continuation of ZHONGSHAN DAXUE XUEBAO No 3, Aug 80 pp 87-91]

The modern distributing center of Schizaea is located in the tropical and subtropical zone of the southern hemisphere, but the fossil spores of Schizaea were found in Late-Triassic and distributed throughout the continent of Eurasia in the Jurassic. Therefore, the distributing center of Schizaea is not the original center, and the Chinese Schizaea seems not to be derived from that of the Malay Archipelago as was suggested previously by certain authors.

AUTHOR: WANG Bosun [3769 0130 1327]

ORG: Department of Biology

TITLE: "The New Distribution of Ferns in China"

SOURCE: Guangzhou ZHONGSHAN DAXUE XUEBAO [ACTA SCIENTIARUM NATURALIUM UNIVERSITATIS SUNYATSENI], Natural Sciences Edition in Chinese No 3, Aug 80 p 92

TEXT OF ENGLISH ABSTRACT: The discovery of tow ferns for the first time in China, Schizaea dichhotoma (L.) Sm. and Drymoglossum piloselloides (L.) Presl. var. platycerioides Teruya, was made on Hainan Island.

AUTHOR: XU Hao [1776 6275]
MA Shuyi [7456 3219 2034]

ORG: Both of the Department of Biology

TITLE: "The Cell Structure and Ultrastructure of Liver Tissue in Freshwater Fish"

SOURCE: Guangzhou ZHONGSHAN DAXUE XUEBAO [ACTA SCIENTIARUM NATURALIUM UNIVERSITATIS SUNYATSENI], Natural Sciences Edition in Chinese No 3, Aug 80 pp 93-99

TEXT OF ENGLISH ABSTRACT: The present paper is a report of our studies in the fine structure of the liver tissue in fish. The cellular structure of fish liver tissue is essentially like that of mammals. The lobules contain anastomosing plates of parenchymal cells and a labyrinthine system of blood sinusoids which radiate from the central vein to the periphery of the lobules.

In this paper we describe the fine structure of liver tissue of freshwater fish and discuss in detail its special structure.

AUTHOR: QIU Quanfa [8002 3123 4099]
LIU Zhensheng [0491 2182 5116]
LI Zaofa [2621 5679 4099]

ORG: All of the Department of Biology

TITLE: "A Preliminary Study on the Radiosensitivities of Rice Embryos"

SOURCE: Guangzhou ZHONGSHAN DAXUE XUEBAO [ACTA SCIENTIARUM NATURALIUM UNIVERSITATIS SUNYATSENI], Natural Sciences Edition in Chinese No 3, Aug 80 pp 100-103

TEXT OF ENGLISH ABSTRACT: The function of uptake of tritiated thymidine (^3H -TdR) in rice embryos was studied by means of liquid scintillation counting. The results showed that gamma-rays had a definite effect on the uptake of ^3H -TdR in rice embryos. In the gamma-ray dosages ranging from 300 to 30,000 r, the rate of incorporation decreased with the increase of radiation dosage. It was assumed that the DNA damage of rice embryonic cells caused by gamma-rays decreased the synthesis of DNA, so the uptake of ^3H -TdR was reduced.

AUTHOR: WANG Yongrui [3769 3057 6904]
LI Zhuojie [2621 0587 2638]
LIN Qihan [2651 0796 3352]

ORG: All of the Department of Biology

TITLE: "A Preliminary Study on the Effect of Seed Treatment with Laser on the Ear Characteristic of Rice"

SOURCE: Guangzhou ZHONGSHAN DAXUE XUEBAO [ACTA SCIENTIARUM NATURALIUM UNIVERSITATIS SUNYATSENI], Natural Sciences Edition in Chinese No 3, Aug 80 pp 104-106

TEXT OF ENGLISH ABSTRACT: 1. The emergence of the ear on rice variety Chen-Chu-Ai can happen one to three days earlier by treating the rice seeds with a CO_2 -laser, and the date of the heading stage of the rice plant can be delayed by one to two days by the same treatment with other lasers.
2. The percentage of full grains, the number of primary branches, secondary branches, grains per ear and 1000 grain weight are increased by the treatment with the N_2 -laser, He-Ne-laser and Ar^+ -laser, but treatment with the N_2 -laser has no effect on increasing the number of full grains of the rice variety Zhai-Ye-Qing. The number of full grains per ear and 1000 grain weight can be increased, but the number of primary branches and secondary branches cannot be increased by treatment with the CO_2 -laser.
3. The protein content in rough rice decreases slightly with the treatment of these

[Continuation of ZHONGSHAN DAXUE XUEBAO No 3, Aug 80 pp 104-106]

four lasers.

These results suggest that seed treatment with lasers could be a better avenue and/or model method in increasing the grain yield of rice.

9717

CS0: 4009

AUTHOR: YANG Xiao [2799 2556]

ORG: Lushou Glass Plant

TITLE: "Photoelectric Transform Circuit of Glass Bottle Counter"

SOURCE: Beijing WUXIANDIAN [RADIO] in Chinese No 9, 25 Sep 80 pp 23-24

ABSTRACT: If a photoelectric transform circuit is used in glass bottle counter to obtain counting signals, due to the fact that the white translucent or semi-translucent glass bottle causes refraction or transmission when it is in the way of the light source, the range of variation of the photoelectric current of the phototube will be thus reduced and the transform wave form will become too complex for normal counting. The author and colleagues designed a photoelectric counting circuit suitable for transparent substances. This paper introduces mainly the photoelectric transform portion of the counter circuit.

AUTHOR: CAI Renming [5591 0088 2494]

ORG: None

TITLE: "Major Properties of Some Plastic Cased Power Transistors for Television Receivers Made in China (Explanation for Inside Back Cover)"

SOURCE: Beijing WUXIANDIAN [RADIO] in Chinese No 9, 25 Sep 80 pp 32, 31, inside back cover

ABSTRACT: In order to meet the needs of large quantity production of television sets, some silicon power triode products sealed in plastic cases have appeared. They are designed for the special use of television sets, and are small, light, and convenient to assemble. Among those listed in the table on the inside back cover of this issue, CS11, CS12, CS15, CS16, CS35, and CS36 are PNP; all the others are the NPN type. Applications of these Chinese made transistors are explained in the paper, while their properties are listed in the table on the inside back cover.

AUTHOR: LU Baofu [6424 1405 1381]

ORG: None

TITLE: "Surface Wave Filter and 'No Adjustment' Intermediate Frequency Amplification Circuit"

SOURCE: Beijing WUXIANDIAN [RADIO] in Chinese No 10, 25 Oct 80 pp 1-2

ABSTRACT: Many intermediate frequency circuits with tuning loop are adopted in all Chinese made black and white television receivers. When a set is completely assembled, it must be repeatedly adjusted in order to obtain the required amplitude and frequency characteristics. This fact has caused inconvenience in the production process and is also the latent factor for trouble when the set is in operation. Following the extensive application of integrated circuits in television, it has become possible to use direct couple wide band amplifier without adding tuning loop to satisfy the gain requirement. If a new component requiring no adjustment may be added to replace the original tuning loop, the intermediate frequency circuit may be made to need no adjustment. The acoustic surface wave filter is just such a new component. Its work theory and structure are described.

AUTHOR: CHANG Jiang [1603 3068]

ORG: Tianjin Television Station

TITLE: "Improving the Clarity of Beijing-840-1"

SOURCE: Beijing WUXIANDIAN [RADIO] in Chinese No 10, 25 Oct 80 p 9

ABSTRACT: Beijing-840-1 is a transistor black and white television receiver with a relatively large screen. All its properties are relatively good except for the fact that its reception is not very clear. The author and colleagues made some changes to its intermediate frequency amplification circuit, its visual frequency amplification circuit, and the accessory circuit of its picture tube to cause the clarity to be greatly improved. These minor changes are described.

AUTHOR: HONG Yan [7703 7159]

ORG: None

TITLE: "Small High Fidelity Speakers"

SOURCE: Beijing WUXIANDIAN [RADIO] in Chinese No 10, 25 Oct 80 pp 12-13

ABSTRACT: This paper introduces the YZX5-1 and YZX5-2 small high fidelity speakers. A photo of these speakers appears on the front cover of this issue of the journal. They are new products of Beijing Radio Plant, No 1. The 4-inch speaker YD110-1 made by the same plant is used as the bass unit. The size of the speaker box is rather small, suitable for the table or bookcase in the homes, but the sound is as good as any 8-inch speakers. The structure and property of these speakers are described.

AUTHOR: WANG Dayuan [3769 1795 3104]

ORG: None

TITLE: "Digital Device for Recording Coal and Water Input of Boilers"

SOURCE: Beijing WUXIANDIAN [RADIO] in Chinese No 10, 25 Oct 80 pp 22-24

ABSTRACT: For the convenience of calculating boiler efficiency and saving coal, the author and colleagues designed and made an attachment for boilers to record numerically the amount of coal and water entering the boiler. The device is suitable for all industrial boilers. The basic work theory and the concrete circuits are given.

6168

CSO: 4009

AUTHOR: ZHANG Baoyou [1728 1405 2589]

ORG: None

TITLE: "Tanks of Tomorrow"

SOURCE: Beijing KEXUE SHIYAN [SCIENTIFIC EXPERIMENT] in Chinese No 10, Oct 80
pp 18-19

ABSTRACT: Tanks will continue to be a primary element in land warfare, and their capabilities will be improved. There is a trend to higher engine power, for example in the US HIMAG vehicle with a 1,500 HP engine and a possible 95 km/hr speed, and the West German VT1-1 and VT1-2, with horsepowers of 2,000 and 2,200 respectively. The suspensions of the XM-1 and Soviet T-80 tanks allow adjustment of hull height and attitude and provide a stable firing platform. Lighter weight is another way of increasing mobility, as in the case of the US HSTV-L, with fighting weight of 14.5-17 tons. Composite armor, such as the British Chobham armor with inner layers of aluminum and ceramic, greatly improves survivability. Elimination of the turret, as in the Swedish S-tank, decreases height and profile, and lightens weight by about 10-20 percent. The German VT1-1 and the US HIMAG vehicles will have a semifixed gun, while the German Leopard 3 will use a movable gun. Larger-diameter rounds, new round types such as armor-piercing fin-stabilized discarding sabot rounds, use of depleted uranium penetrators, and fire control systems incorporating two-dimensional gun stabilizing, laser rangefinders, ballistic computers and infrared and low-light imaging, are improvements in the tank arsenal.

AUTHOR: LI Dajue [7812 2192 3635]

ORG: Botanical Garden, Institute of Botany, Chinese Academy of Sciences

TITLE: "The Safflower, an Oil Plant Which Protects Against Heart and Blood Vessel Disease"

SOURCE: Beijing KEXUE SHIYAN [SCIENTIFIC EXPERIMENT] in Chinese No 10, Oct 80
p 32

ABSTRACT: In 1976 the Beijing Botanical Garden, CAS, imported some United States and Mexican safflower varieties for experimental planting and study. Safflower seeds may contain 35-44 percent or more of oil, with a very high (72-80 percent) linoleic acid content, making it useful in protecting against heart disease. Industrial uses of safflower oil include paints and varnishes, in which it has good color stability, and alkyd resins. Seed cake makes a good animal feed. The flowers produce a dye, and the plant has a wide range of medicinal uses, including the treatment of coronary heart disease, in which it produces a rather rapid and steady effect and has almost no side effects, so that it can be used by individuals with high blood pressure. It should grow well in arid and semiarid areas of North China. In China, yields of up to 800 jin of seed and 80 jin of dried flowers per mu have been achieved.

AUTHOR: YANG Weichao [2799 0251 6389]

ORC: None

TITLE: "Health Effects of Electrical Pollution"

SOURCE: Beijing KEXUE SHIYAN [SCIENTIFIC EXPERIMENT] in Chinese No 10, Oct 80
p 38

ABSTRACT: Many animals avoid the vicinity of high-voltage transmission lines, and workers may become ill when working near them. Discharges produced by the lines produce ozone and nitrogen oxides, which may be injurious to health. In addition, high frequency alternating current can produce radio and television interference, and high-voltage electric fields can produce various neurological disorders, tachycardia, increased blood pressure and EKG and serum changes, increased reticulocyte counts and the like. Effective methods of protection include: use of stranded cables to increase conductive cross section, increased height of supports, and avoidance of passage of transmission lines through populated areas; remote control of power line equipment, to relieve workers of the necessity of working too close to the lines; limitations on the time workers can spend in areas with strong electric fields, and provision of clothing with copper wire woven into it for protective purposes.

8480

CSO: 4009

AUTHOR: SUN Huizhong [1327 1920 0022]

ORG: None

TITLE: "Space Astronomical Observatory"

SOURCE: Beijing KEXUE SHIYAN [SCIENTIFIC EXPERIMENT] in Chinese No 11, 80 pp 6-7

ABSTRACT: This paper relates the history of astronomical observation from Galileo's telescope in the early 17th Century to today's astronomical satellites. Before the 60's, the astronomical observation wave bands were mainly the visible light, the infrared, the radio wave, and the microwave regions, while the observational tools were mainly optical and radio telescopes. By the 70's, more than 100 astronomical satellites had been launched by the various countries. With these space observatories, mankind is now capable of measuring the various forms of radiation of celestial bodies and the high energy particles of the universe. Important advancement has been made in high energy astronomical observation to reach regions of x-ray and gamma ray wave bands. Of the existing astronomical satellite the ANS of Holland is singled out for more detailed discussion in the paper.

AUTHOR: YU Zaiyang [0060 0961 3152]

ORG: None

TITLE: "Sweptfront Wing Aircraft"

SOURCE: Beijing KEXUE SHIYAN [SCIENTIFIC EXPERIMENT] in Chinese No 11, 80 p 18

ABSTRACT: A basic characteristic of the wings of birds is that they are generally sweptback during flight. This is the result of natural selection in millions of years of struggle for survival. The first problem to be resolved for early airplanes was lift; therefore, only straight wings were used. Later, when speed requirements were raised continuously, the sweptback wings were born. In 1948, they were first adopted for Mig 15 of the USSR and the F-86 of the USA, and they improved the speed of these aircrafts a great deal. Modern fighter planes also have wings of variable sweepback angles during flight to improve their high speed as well as low speed properties. They are called task-adaptable wings. The even stranger shape of aircraft wings is the sweptfront wings, which are now being studied by some aircraft companies in the USA. At present, certain companies have put this type of wings on the F-16 fighter planes to carry out large scale wind-tunnel tests. Sweptfront wings were tested by Germany toward the end of WWII, but there were many technical problems. It is only due to the advancement of electronic computers and the availability of strong and light weight materials of today that some of these problems may be resolved. It is the prediction that in the middle and late 90's the sky will be full of aircrafts with all sorts of strange shaped wings.

AUTHOR: BAO Yunqiao [7637 0061 2881]

ORG: None

TITLE: "What are the Secrets Revealed in the 'Hydrogen Bomb Leak Case'?"

SOURCE: Beijing KEXUE SHIYAN [SCIENTIFIC EXPERIMENT] in Chinese No 11, 80 pp 11-12

ABSTRACT: In March 1979, the courts of the USA issued 2 injunctions to stop the publication of an article titled the SECRET OF HYDROGEN BOMB by a California newspaper. Later, it was discovered that the source materials used by the author were all available to the public in the Los Alamos library, among the documents released by the USA government from 1971 to 1976. Under the pressure of public opinion, the courts were forced to rescind the injunction orders. Although, it appears that the article does not in fact reveal any secret information, it does allow the general public of the world to learn something about modern strategic and tactical nuclear weapons. This paper reports briefly the so-called hydrogen bomb secrets revealed in that article. There is also a brief discussion of ways of miniaturizing nuclear weapons and the various new tactical nuclear weapons, including the proton bombs of the USSR and neutron bombs of the USA.

AUTHOR: WANG Changyan [3769 7022 3508]
QU Jucheng [2575 5112 2052]

ORG: None

TITLE: "Strategic Warning"

SOURCE: Beijing KEXUE SHIYAN [SCIENTIFIC EXPERIMENT] in Chinese No 11, 80 pp 36-38

ABSTRACT: Based upon a general idea of the strategic warning system and the missile defense system of the USA, the paper gives a general and haphazard explanation of the importance of strategic warning, the modernized strategic warning network, warning and anti-warning techniques, ultra long distance radar, electromagnetic wave barrier, etc.

6168

CSO: 4009

AUTHOR: ZHANG Xihui [1728 0013 4614]
YANG Anlu [2799 1344 4389]
CHEN Guangyu [7115 0342 439B]
et al.

ORG: All of Chengdu Institute of Radio Engineering

TITLE: "An Automated Frequency Measuring System Implemented with the IEC-IB"

SOURCE: Beijing YIQI YIBIAO XUEBAO [CHINESE JOURNAL OF SCIENTIFIC INSTRUMENTS] in Chinese Vol 1 No 4, Nov 80 pp 1-17

TEXT OF ENGLISH ABSTRACT: This paper describes an automated frequency measuring system. The system consists of a 300 MHz frequency counter with a 9-digit display, a paper strip printer with 12 columns and a hard-wired logic controller, all implemented with the IEC-IB (equivalent to the American IEEE Std 488 or HP-IB). The devices and components in the system are solely made in China. This demonstrates that it is possible to develop instrumentation and ATS with IEC-IB in China.

AUTHOR: CAI Minxue [5591 2404 1331]

ORG: Qinghua University

TITLE: "A Pneumatic Bridge in Adverse Circumstances"

SOURCE: Beijing YIQI YIBIAO XUEBAO [CHINESE JOURNAL OF SCIENTIFIC INSTRUMENTS] in Chinese Vol 1 No 4, Nov 80 pp 18-23

TEXT OF ENGLISH ABSTRACT: This article introduces a pneumatic bridge in adverse circumstances. The bridge may retain its equilibrium with varying supply, and is free from block up while the measuring object is in a dusty environment and the supply is in a negative pressure. The varying supply cannot affect the equilibrium of the pneumatic bridge while the ratios of the exponents of the bridge-arms are equal. In addition, an alternating bias pneumatic bridge is designed to avoid block up.

AUTHOR: GUO Shuxing [6753 2885 5281]

ORG: Beijing Third Radio Equipment Factory

TITLE: "High Frequency Parameter Measurement of Fixed Condenser"

SOURCE: Beijing YIQI YIBIAO XUEBAO [CHINESE JOURNAL OF SCIENTIFIC INSTRUMENTS] in Chinese Vol 1 No 4, Nov 80 pp 24-33

TEXT OF ENGLISH ABSTRACT: This paper describes the measurements of several high frequency parameters of the fixed condenser by a resonance method with the aid of a wide frequency band Q meter. It includes the separate detective analyses of the equivalent serial and paralleled resistances, the serial inductance and high frequency dissipation (within 300 MHz). This paper also analyzes the measuring accuracy quantitatively.

AUTHOR: LIN Yingrong [2651 2019 2837]

ORG: Jinan University

TITLE: "An Optical Compensation Modulation of Effective Signal in the Absorption Spectrometry"

SOURCE: Beijing YIQI YIBIAO XUEBAO [CHINESE JOURNAL OF SCIENTIFIC INSTRUMENTS] in Chinese Vol 1 No 4, Nov 80 pp 34-38

TEXT OF ENGLISH ABSTRACT: This paper introduces the principle of an optical compensation modulation of an effective signal in atomic absorption spectrometry. The theoretic discussion and analogue experimental datum proved that it can eliminate the effect of a negative signal on the Beer-Lambert law, and enhance the measuring sensibility.

AUTHOR: Xi Hongxiang [1153 7703 6116]

ORG: China Scientific Research Center of Shipbuilding

TITLE: "The Laser Velocimetry of Fluid Field in Hydrodynamics"

SOURCE: Beijing YIQI YIBIAO XUEBAO [CHINESE JOURNAL OF SCIENTIFIC INSTRUMENTS] in Chinese Vol 1 No 4, Nov 80 pp 39-44

TEXT OF ENGLISH ABSTRACT: This paper presents the mechanical scanning method of digital control of the fluid field in hydrodynamics. According to the method, a "Laser Velocimetry Automatic Scanning Machine" is designed. Its principle, construction and experimental results are given. It shows that the accuracy, efficiency and experimental results of the meter are satisfactory.

AUTHOR: FAN Dajun [2868 1129 6874]

ORG: Beijing Institute of Technology

TITLE: "Theoretical Analysis for Bellows Welded by Ring Shells"

SOURCE: Beijing YIQI YIBIAO XUEBAO [CHINESE JOURNAL OF SCIENTIFIC INSTRUMENTS] in Chinese Vol 1 No 4, Nov 80 pp 45-56

TEXT OF ENGLISH ABSTRACT: Each diaphragm of bellows is a ring shell. R/a of the shell is in the range of 0.8 to 1.2. Therefore, we cannot use the general solutions of the slender ring theory. In this paper, according to A. I. Lur'ye's equation of axial symmetrical loaded shell of revolution, the equations of the ring shell theory within the range of $0.8 \leq R/a \leq 1.2$ are derived. V. V. Novzhilov's equation is a specified case of the equations derived. The solutions of the equations derived in this paper are the theoretical bases for designing the welded bellows.

AUTHOR: FU Zhichao [1381 5268 6389]

ORG: Harbin Research Institute for Electromagnetic Measuring Instrumentation

TITLE: "Integral Error of an Integrating Type A-D Converter and Its Optimum Arrangement of Integration"

SOURCE: Beijing YIQI YIBIAO XUEBAO [CHINESE JOURNAL OF SCIENTIFIC INSTRUMENTS] in Chinese Vol 1 No 4, Nov 80 pp 57-63

TEXT OF ENGLISH ABSTRACT: In an integrating type A-D converter, the relation between integral error and integral value of output voltage from the integrator within one work period has been verified. This paper presents that "the independence of the average output voltage from the integrator to the measured voltage and the approach of this average output voltage to zero level" can be used as an intuitive estimation of integral error of the converter, and it can be used as a criterion for assessing the principle scheme of the converter in considering whether it is reasonable. The principle shortcomings of some common types of converters are pointed out.

The relation between the arrangement of integration and the integral error has been analyzed. Theoretically, the optimum arrangement of integration is to arrange the integration in a time sequence according to the symmetrical principle. This arrangement can reduce the integral error to a great extent, and it is a new approach in developing high accuracy integrating type digital voltmeters.

AUTHOR: SHI Lixiu [0670 0632 0208]
OU Jincal [2962 6930 2088]

ORG: Both of Xi'an Instrument Factory

TITLE: "An Approach to the Experimental Design of Corrugated Diaphragms"

SOURCE: Beijing YIQI YIBIAO XUEBAO [CHINESE JOURNAL OF SCIENTIFIC INSTRUMENTS] in Chinese Vol 1 No 4, Nov 80 pp 64-70

TEXT OF ENGLISH ABSTRACT: This paper states the experimental design of the adjustable forming die adopted to use in the design of corrugated diaphragms. Cited in this paper are the theoretical basis of this design method, chief means and fundamental procedures. Some examples are also cited in the illustrations of this paper.

AUTHOR: WANG Guangsheng [3769 1684 3932]
SUN Liang [1327 0081]

ORG: Both of Beijing Polytechnic University

TITLE: "An Investigation on the Modification of Temperature Drift in the IC Operational Amplifier"

SOURCE: Beijing YIQI YIBIAO XUEBAO [CHINESE JOURNAL OF SCIENTIFIC INSTRUMENTS] in Chinese Vol 1 No 4, Nov 80 pp 71-82

TEXT OF ENGLISH ABSTRACT: This paper analyzes the factors that affect the input offset voltage V_{os} and temperature drift $\frac{\partial V_{os}}{\partial t}$ in the IC operational amplifier. It introduces a method to reduce V_{os} and $\frac{\partial V_{os}}{\partial t}$. The collector resistance and current in the next voltage of the preamplifier should be adjusted carefully, and a low-drift point corresponding to the zero offset voltage may be obtained. In the temperature range of $0\sim 60^{\circ}\text{C}$, V_{os} and $\frac{\partial V_{os}}{\partial t}$ will be less than 10 nV and $0.5\text{V}/^{\circ}\text{C}$ respectively.

AUTHOR: XU Xilin [1776 6932 2651]

ORG: Shanghai Jiaotong University

TITLE: "On the Determination of Bearing Rigidity in Dynamic Balancing Machine Design for Large High Speed Rotors"

SOURCE: Beijing YIQI YIBIAO XUEBAO [CHINESE JOURNAL OF SCIENTIFIC INSTRUMENTS] in Chinese Vol 1 No 4, Nov 80 pp 83-90

TEXT OF ENGLISH ABSTRACT: The reasonable selection of bearing rigidity of the pedestal is the crux in designing the dynamic balancing machine for large high speed rotors. This paper reveals the effect of bearing rigidity of the pedestal on the mode of vibration of flexible rotors and the rule of variation with the aid of theoretical analysis and experimental research. This paper offers the theoretical basis for designing the bearing rigidity of the pedestal of the dynamic balancing machine for large high speed rotors.

AUTHOR: HE Zhenjiang [0149 2182 3068]

ORG: Chongqing University

TITLE: "Photoelectric Sensor for Surface Flaw Detection"

SOURCE: Beijing YIQI YIBIAO XUEBAO [CHINESE JOURNAL OF SCIENTIFIC INSTRUMENTS] in Chinese Vol 1 No 4, Nov 80 pp 91-98

TEXT OF ENGLISH ABSTRACT: This paper describes the features, principle and sorting method of the photoelectric sensor for surface flaw detection. The computing method of the sensor sensitivity, signal-to-noise, are described. The number of D and K for 1 micron resolving power is computed. An optical method for classifying defects and the gists of design and the method of evaluating function on the sensor are also presented.

AUTHOR: SUN Zhiwei [1327 4363 0251]

LI Wei [2621 0251]

SUN Tongkun [1327 0681 0981]

SUN Chuanxiang [1327 0278 7449]

ORG: All of the Institute of Mechanics, Chinese Academy of Sciences

TITLE: "A Water-Cooled Integrating Sphere Laser Power Meter"

SOURCE: Beijing YIQI YIBIAO XUEBAO [CHINESE JOURNAL OF SCIENTIFIC INSTRUMENTS] in Chinese Vol 1 No 4, Nov 80 pp 99-103

TEXT OF ENGLISH ABSTRACT: A water-cooled integrating sphere laser power meter, using metallic rough surface for its diffusely reflecting surface, has been described in this paper. The power meter is calibrated by a reference energy meter and has the following special advantages: fast response (10^{-1} sec), better reproducibility ($< 1\%$) and wide measuring range (from 1 to 10^3 W). The resulting difference between the meter and national standard high power meter in measuring the same laser output is within 1%.

AUTHOR: YANG Yemin [2799 2814 2404]
JIN Hui [6855 6540]

ORG: Both of the Institute of Mechanics, Chinese Academy of Sciences

TITLE: "The Development, Manufacture and Application of the Digital Controlled Flash X-Ray Synchronizer"

SOURCE: Beijing YIQI YIBIAO XUEBAO [CHINESE JOURNAL OF SCIENTIFIC INSTRUMENTS] in Chinese Vol 1 No 4, Nov 80 pp 104-109

TEXT OF ENGLISH ABSTRACT: This paper introduces a new synchronizer which can control several flash X-ray devices. It possesses high quality anti-interference, high accuracy and is convenient to operate. This paper discusses the method of anti-interference and how to insure the accuracy in operation. It also gives the breakdown process of a detonator and the developing process of a shaped charge jet in X-ray photographs.

AUTHOR: LU Xigan [4151 1585 2413]

ORG: Shenyang Institute of Instrument Techniques

TITLE: "On the Relation between Power Source Rejection Ratio, Open Loop Voltage Gain and Common Mode Rejection Ratio of an Operational Amplifier"

SOURCE: Beijing YIQI YIBIAO XUEBAO [CHINESE JOURNAL OF SCIENTIFIC INSTRUMENTS] in Chinese Vol 1 No 4, Nov 80 pp 110-115

TEXT OF ENGLISH ABSTRACT: Based on the principle of relativity of electric potential, this paper induces a formula that indicates the relation between D.C. small signal power source rejection ratio, open loop voltage gain and common mode rejection ratio of an operational amplifier.

9717
CSO: 4009

AUTHOR: WEI Junquan [7614 0193 0356]

ORG: None

TITLE: "Test Drilling of 50m Deep Holes With Plasma Flame Current"

SOURCE: Chongqing DIXIA GONGCHENG [UNDERGROUND ENGINEERING] in Chinese No 8, Aug 80 pp 1-5

ABSTRACT: This paper reports the use of plasma flame current to drill vertical holes 50m in depth. A total of 12 holes were drilled. The deviation was generally 2-4m. As the depth of the hole increases, the deviation is found to become greater. Under normal conditions, plasma flame is found to be 3-4 times faster than mechanical drills at a cost only 50 percent of that of mechanical drills for drilling through hard rocks. During operation, there is only the harmful gas of N_2O_5 , unlike compressed air (diesel) flame drills which produce harmful gas as well as combustible gas. The technique of plasma flame drilling, the structure and parameters of air plasma gun, and the structure of the advancing device used in the experiment are described.

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TITLE: "Noise Attenuation Design for Underground Construction Engineering"

SOURCE: Chongqing DIXIA GONGCHENG [UNDERGROUND ENGINEERING] in Chinese No 8, Aug 80 pp 6-11

ABSTRACT: Frequencies of noises of shops of various types, such as boilers, diesel generators, water pumps, air compressors, die-casting, vibration polishing, etc. are analyzed in search of various ways of muffling these noises of underground plants. Toward the end of the paper, measures of adding ventilation pipes and installing acoustic insulating materials such as glass wool and perforated boards etc. are described, as well as the noise reduction effects when these measures are applied to improve the condition of an unnamed underground factory.

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TITLE: "Dehumidification of Underground Structures"

SOURCE: Chongqing DIXIA GONGCHENG [UNDERGROUND ENGINEERING] in Chinese No 8, Aug 80 pp 12-14

ABSTRACT: Currently, the problem of large quantities of moist air or the phenomenon of condensation exist in all underground structures that have been completed and put to use. The condition of high humidity directly affects the quality of the structure. Materials stored in underground warehouses will rot and machines will become corroded. It is generally believed that this condition is the result of improper drainage, but the drainage of many of these caves is relatively satisfactory but there is still problem of condensation whenever a slight dampness occurs. The author analyzes the causes to be the fact that too much water was used to mix the concrete during construction, hot and moist air were allowed to seep into the cave, moisture brought into the cave by workers and materials, and humidity of the water used and drained in the underground structure. Dehumidification measures discussed in the paper include natural ventilation, applying calcium chloride, mechanical dehumidification, sealing doors and other entrances to the cave, and installing curtains and other insulating materials.

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TITLE: "Natural Ventilation of Underground Structures"

SOURCE: Chongqing DIXIA GONGCHENG [UNDERGROUND ENGINEERING] in Chinese No 8, Aug 80 pp 19-29

ABSTRACT: With the rapidly increasing number of underground structures in China, natural ventilation has been increasingly favored by many due to the advantages of economy, freedom from noise, and natural dehumidification during winter months. Natural ventilation depends upon wind power and the temperature differential inside and outside of the structure, however. It is, therefore, difficult to determine the average weather condition for the calculation of the various parameters to obtain effective natural ventilation. This paper discusses the various problems in designing natural ventilation of underground structures and various ways of calculating wind speed, air pressure, structural resistance, etc.

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TITLE: "Application of Sound-wall Blasting and Shotcreting Technology in China's Engineering"

SOURCE: Chongqing DIXIA GONGCHENG [UNDERGROUND ENGINEERING] in Chinese No 10, 11 Oct 80 pp 1-7

ABSTRACT: Due to the coordinated application of sound-wall blasting and shotcreting in recent years, success has been achieved even under the condition of unfavorable geology and large sized rock-chamber. This paper reports applications of these 2 techniques in coal mine transportation tunnels, railway tunnels, dry-docks, aqueducts of hydroelectric power stations, etc. Methods for calculating the design parameters of these techniques, outstanding problems, and trends of future development are discussed.

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TITLE: "Elastic Wave Speed and Measurement of Three Dimensional Stress of Rock Body"

SOURCE: Chongqing DIXIA GONGCHENG [UNDERGROUND ENGINEERING] in Chinese No 10, 11 Oct 80 pp 8-13

ABSTRACT: The elastic wave technique is being tried here and abroad to determine the three dimensional stress of rock bodies to replace stress release. This paper discusses the technique by explaining the relationship between elastic wave speed and elasticity constant of the medium, between elastic wave speed and variation of the state of stress, and some foreign and domestic experimental data concerning elastic wave speed stress state.

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TITLE: "An Inquiry Into the Mechanism of Anchor Rod Action"

SOURCE: Chongqing DIXIA GONGCHENG [UNDERGROUND ENGINEERING] in Chinese No 10,
11 Oct 80 pp 19-27

ABSTRACT: For the purpose of clarifying the designing principle of anchor rods, this paper investigates the effects of this form of support medium and the stress state of the surrounding rocks under the action of anchor rods. Under the condition of unfavorable geology, the support action of bolting depends entirely upon the prestress P of the anchor rod. In order to guarantee the long term safety of the tunnel, therefore, attention must be given to stress slacking of the anchor rods. This paper deals largely with horizontal problems, while the stress produced by the anchor rods in the surrounding rocks is a problem of three dimensional space. The values obtained by the equations discussed in the paper are, therefore, definitely too high for practical applications.

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TITLE: "Types of Anchor Rods"

SOURCE: Chongqing DIXIA GONGCHENG [UNDERGROUND ENGINEERING] in Chinese No 10,
11 Oct 80 pp 28-35

ABSTRACT: According to related reports, there are about 600 types of anchor rods and there are many ways of classifying them. First they are divided into those that have no prestress and those that have different sizes of prestress. Some classify anchor rods according to the material of which the rod is made. There are, therefore, metal rods, wood rods, glass fiber rods, plastic rods, and mixed rods. When anchor rods are divided according to the manner of fixing it in the hole, there are the mechanical, the blast, the cement bound, and the polymer glued, etc. According to anchor stabilizing theory, there are the impact type, the swelling casing type, the enclosed type, the screw thread type, and the solid body type. Guided by both domestic and foreign materials on the subject matter, this paper collects and describes anchor rods according to the theory of their stabilizing action.

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